2018-04-18

Advanced Swarm UAV Capabilities through Collaborative Field Experimentation

Davis, Duane; Jones, Kevin; Jones, Marianna; Giles, Katy

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EXCELSIO PER INNOVATIO
ARSENL
Advanced Robotic Systems Engineering Laboratory

Swarm Concept to Capability

Background & History

- **Counter-Swarm Focus Beginning in 2011**
  - **Research Objective**: development & live-fly demonstration of capabilities required for saturation attack defense using autonomous swarms
  - Competition-based approach to collaborative development
  - Leverage open source & hobby communities, COTS, & additive mfg.
- **Milestones**
  - Single-UAV ops from 2012 to 2014
  - 50-vehicle (fixed-wing) swarm demonstration in August 2015
  - Multi-swarm capability demonstration in December 2015
  - Adversarial swarm versus swarm events in 2017
  - Heterogeneous swarms (fixed-wing & quadrotor) in 2017

2017-2018 Summary

- **Adversarial Multi-Swarm Events**
  - Service Academy Swarm Challenge
- **Technology Fleet Transition**
  - USMC Tactical Training and Exercise Control Group (29 Palms)
- **Platform Development**
  - Fixed wing and quadrotor
- **Tactical Swarm Behavior Development**
  - Realistic OPFOR in live training environments
  - Distributed autonomy and emergence

Looking Forward

- **Platform Development**
  - Improved performance, operability, and maintainability
  - Sensor integration, modularity…
- **Swarm Capability Development**
  - Heterogeneous swarms
  - Consensus & market-based approaches to distributed decision making
  - Counter-swarm & swarm versus swarm
- **Human-Swarm Interaction**
  - Composeable and mathematically rigorous behavior framework
  - Paradigms supporting more robust behaviors & improved performance
  - Intuitive & flexible C2 & interface models

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